

ject-matter appears to be quite a proper one, for at the present time almost everyone is familiar with the elementary properties of gear-wheels, clutches, the mechanism of steam engines and the like, because of their increasing use in everyday life, and more especially of late, owing to their applications to self-propelled vehicles. On the other hand their less obvious, although not less important, properties are possibly not so well understood; thus, to take a single instance, the conditions to be satisfied in order to produce true rolling motion by gear wheels require a knowledge of the properties of various curves, and this latter subject may well be left to a later stage, as is done in the present work, although it need not prevent a study of machines containing gear wheels when this knowledge is not absolutely necessary for the purpose. The author has therefore described many machines using higher pairing quite early in the book, and has left the more detailed examination of some of the elements for later chapters; this adds very much to the general interest of the reader, while its drawbacks are small. The work opens with an introductory chapter in which the usual definitions occur relating to machines, kinematic chains, lower and higher pairs, and the like, and this is followed by a chapter which is exceedingly interesting on simple machines and machine tools.

Chapters iii. and iv. deal chiefly with mechanisms of the quadric crank and double slider crank chain forms, all those possessing important geometrical properties being grouped together. Naturally the pantograph finds an important place here, and to amplify this section there are descriptions of the copying lathe and also a machine on the same principle for drilling square and hexagon holes. In a future edition it might be worth while to insert, in a suitable place, an account of the epicyclic trains which form an essential part of some machines for turning nuts and bolts to a practically perfect square or hexagon section.

The next two chapters deal with velocity and acceleration diagrams, and we are sure that all students of mechanism will feel greatly indebted to the author for the clear manner in which he has presented this part of the subject. The remainder of the book deals with gear wheels, non-circular wheels and cams, and these are discussed on the usual lines. There is also a section devoted to gear-cutting machinery, which gives an interesting account of this special branch of machine tool work.

It is somewhat remarkable that no place is found in the book for the consideration of so fundamental a subject as the degrees of freedom possessed by a body and the applications which follow from a recognition of these principles in geometrical slides and clamps, such as are described in Thomson and Tait's "Natural Philosophy." Ignorance of these fundamental principles has been one of the most fruitful causes of bad design in mechanism.

The illustrations are mainly line drawings, exceedingly well adapted for descriptive purposes, and with a few exceptions the photographs of machinery are clear and distinct. A series of numerical examples at the end of the book will be of much value to students.

The author has succeeded in writing a valuable text-book on mechanism which will repay a careful study by engineers and others who wish to obtain a knowledge of something more than the elements of this branch of science.

E. G. C.

#### PRACTICAL ELECTROCHEMISTRY.

*Practical Methods of Electrochemistry.* By F. Mollwo Perkin. Pp. x+322. (London: Longmans and Co., 1905.) Price 6s. net.

ELECTROCHEMICAL methods, both of analysis and preparation, have in recent years undergone such rapid development, and have reached such a degree of importance, that systematic instruction in their employment has become an indispensable part of the training of the modern student of chemistry. This book, therefore, forms a welcome addition to the ordinary laboratory manuals.

After a general account of electrical magnitudes and units, measuring instruments, and electrolytic apparatus, the author gives practical instructions for electrochemical analysis. The conditions for the quantitative electrodeposition of the individual metals are first discussed; then follows a section on quantitative oxidation and reduction at the electrodes, and, finally, directions are given for the separation of metals from mixed solutions of their salts. The last and longest section of the book deals with preparative electrochemistry. The primary subdivision of the subject is into the preparation of inorganic and of organic compounds, the latter section being treated in three chapters on organic electrolysis, reduction of organic compounds, and oxidation of organic compounds respectively.

The practical instructions are on the whole adequate and accurate, so that the student could acquire with little assistance a sufficient acquaintance with the working methods of electrochemistry. Whilst the book is satisfactory in this, the most important feature, it shows in other respects many signs of hasty composition, which greatly detract from its value. For example, there are frequent evidences of haste in the treatment of electrical units. In the table on p. 9 the heading of the last column but one is "electrochemical equivalent per coulomb in mg. per sec."; the words "per sec." are not only superfluous but misleading. On p. 29 we find "1 kilowatt=101.93 kilogrammeters," and "1 horsepower is 75 kilogrammeters," where the words "per second" should have been added in both cases. Nothing is more detrimental to clear thinking on the part of the student than slipshod statements of this kind. Again, in the table of "useful data" on p. 286 we find "1 kilowatt=1000 watt-hours," and "volt  $\times$  amperes=watts." Such data are the reverse of useful. A curious batch of mistakes is to be found on pp. 231-232. It is stated on p. 231 that the electrolyte for the preparation of diethyl succinate is "acid potassium or sodium malonate" instead of "ethyl potassium or sodium malonate." On the same page we twice find "diethyl adipic acid" instead of *diethyl adipate*, and on the succeeding pages a similar error

is repeated. On pp. 226-227 it is surely wrong to ascribe the formation of the trace of ethylene found during the electrolysis of an acetate to the same cause as that which produces the plentiful yield of ethylene during the electrolysis of a propionate. The fact that equation v. is divisible by 2, and that equation iv. is not so divisible, is almost in itself sufficient evidence that the actions are of essentially different character. It is somewhat surprising to find that the kathodic reduction of nitrites, nitrates, and arsenical compounds finds treatment under the heading "Metals deposited as Oxides at the Anode" (pp. 145-150). These and similar slips are minor blemishes; but it is to be hoped that the author will subject his book to a thorough revision for their removal when a second edition is called for.

The references to original papers are numerous, and a convenient table of five-figure logarithms, with instructions for its use, is contained in an appendix. The value of the table might be still further augmented by the inclusion of instructions for the use of the decadic complements of logarithms, a device of which the chemical student is almost invariably ignorant.

#### OUR BOOK SHELF.

*Das Alter der wirtschaftlichen Kultur der Menschheit, ein Rückblick und ein Ausblick.* By Ed. Hahn. Pp. xvi + 256. (Heidelberg: Carl Winter, 1905.) Price 6.40 marks.

IN the opinion of Dr. Hahn, well known as the inquirer who revolutionised our ideas on the so-called "three stages"—hunting, pastoral pursuits, agriculture—the mass of the reading public will not change its traditional views on pre-history and primitive culture unless the specialist is prepared to do more for it than issue specialist literature. With the object of making propaganda for his views on the domestication of animals, the forms of cultivation, the transition from hoe-cultivation to plough-cultivation, the invention of the plough, the use of the ox as draught-animal, the share of woman in primitive culture, and especially the development of personal property, Dr. Hahn has written the present work, and his object in so doing is commendable. Even specialist literature, however, is not above all considerations of form and logical sequence of ideas; in an *oeuvre de vulgarisation* it is *a fortiori* necessary that there should be an orderly development of facts and of the conclusions to be drawn from them; and this, unfortunately, Dr. Hahn has not given us. Not only is the book in places indigestibly full of facts the connection of which with the main argument is not always made clear, but too much is attempted; to the list of subjects given above must be added the description of the economic conditions and interrelations of China, Babylonia, India, and Egypt, a discussion of the origin of the wheel and the waggon, much polemical matter, dealing with criticisms which the public has never read, and finally excursions on the fiscal question, socialism, and other subjects unconnected with his immediate purpose. It would be unfair to deny that the book is interesting and stimulating, but it is rather a *causerie* than an exposition of the author's theories. This is the more unfortunate because his views on the domestication of animals, the forms of cultivation, and the stages of economic evolution are largely accepted. From mere lack of literary skill Dr. Hahn will leave his readers comparatively

unmoved. As an example of the deficiencies of the book we may mention that the process of domestication of cattle is dismissed with a mention. Many of the author's theories are improbable; it is unnecessary to suppose that the curved horns imitating the shape of the crescent moon first led to the sacro-sanctity of cattle; there are animal cults everywhere. Personal property, even in vegetable food, was known before domesticated plants; the Australian natives store up *bunya-bunya* nuts. We do not need to look to the apparent motion of the stars for the explanation of the origin of Babylonian god-processions, which are a natural method of disseminating the holy influence. The connection of sexual ideas with agriculture may be secondary; syncretism is disregarded in this and other instances. It may not be out of place to say that a few maps of culture areas would have been very helpful, and not to the general reader only.

N. W. T.

*Infantile Mortality and Infants' Milk Depôts.* By G. F. McCleary, M.D., D.P.H. Pp. xiv + 135. (London: P. S. King and Son.) Price 6s. net.

THE publication of the evidence before the Inter-Departmental Committee on Physical Deterioration has directed general attention to such subjects as infant feeding. The decreasing birth rate and the appallingly high death rate among infants are dealt with by the author in the earlier chapters of his book.

An increasing number of mothers are unable to nurse their children, so that some method of artificial feeding has to be adopted. The death rate in 1904 among children under one year was 146 per 1000 births, and even these figures by no means represent the total evil, for many of the survivors must be seriously affected. How can this fearful waste of life be stopped? Dr. McCleary deals with one solution, viz. the establishment of depôts worked by the municipality and partially rate-supported. It is generally agreed that cow's milk is the best substitute for human milk. Various opinions are held as to the degree of modification that may be necessary, but pure cow's milk is the *basis* from which to work.

Even if a pure milk were on the market the poor could not afford to buy it. The question of State assistance arises. Dr. McCleary leaves the moral question as to whether it is for the ultimate good of a people to relieve them of their parental duties. Within the compass of 130 pages he wisely restricts himself to the practical working of the depôts, and as he speaks with knowledge of the Battersea depôt his testimony is of interest. In France the milk depôt system is carried out to a considerable extent, unmodified sterilised milk usually being supplied (Budin's method). In America the tendency is to follow Rotch in giving modified unsterilised milk.

The author repeats the necessary warning that a dirty milk is not made clean by sterilisation, and from this it follows that no depôt is on a satisfactory basis unless it has absolute control of its own milk supply. Dr. McCleary advocates much more stringent supervision of the general milk supply, and the establishment of municipal depôts on the lines of that at Rochester, U.S.A.

The book is well illustrated.

*A Critical Revision of the Genus Eucalyptus.* By J. H. Maiden. Parts i. to v. Pp. iv + 146. (Sydney: W. A. Gullick, 1903-4.)

THE classification of the Australian eucalypts presents similar difficulties to those which confront the botanist who undertakes the arrangement of the Hieracia or Rubi of our native flora, with the additional disadvantages that the eucalypts are trees or shrubs, and their distribution is more extensive. In the cir-